

Pebble Count: Lincoln Park Beach
November 27, 2002 and May 23, 2003
14:00-15:30
Low Tide

Overview

The 2002 Lincoln Park Beach Re-Nourishment Replacement construction occurred on October 17, 18, 21, 22, 23, and 24, 2002. The purpose of the project was to replace material eroded from the beach since the last re-nourishment event in 1994. Washed sand and gravel was delivered from the DuPont pit of Glacier Northwest to the beach at low tide via a conveyor from a barge. Equipment was delivered to the work area by another barge. The barges were held in position by several spuds. The stockpiled material was spread with a backhoe holding a spreader bar. All work was done in the dry and no in-water work occurred. However, high tide covered at least some portion of the new material twice a day. For the project, 1,500 cubic yards (cy) of 1½"-minus gravel and 250 cy of fish mix (coarse sand and pea gravel) were placed between +6' and mean higher high water. An additional 250 cy of coarse sand was placed at about +16' adjacent to the existing seawall. The gravel and coarse sand was placed on 500 linear feet of beach, and the fish mix placed on about 300 linear feet of beach immediately south of the new gravel

Alicia Austin (PM-PL) and Evan Lewis (PM-PL-ERS) conducted pebble count surveys at Lincoln Park beach November 27, 2002, and May 23, 2003 as part of post renourishment monitoring activities. The results of the two surveys were compared to identify beach migration of renourishment material.

Methods:

We sampled three sections of the Lincoln Park Shoreline, beginning at the Southern boundary of Lincoln Park to ~30 feet south of the second light pole from the South boundary (approximately 1200 linear feet). The sections include: Section 1, Lincoln Park boundary to southernmost bench, from logs to 4.5 meters waterward; Section 2, southernmost bench to 30' south of light post, from bulkhead to 64' water ward; and, Section 3, north side of picnic shelter (4) to 30' south of next light pole, from bulkhead to 65' water ward. Section 1 includes the 300' of fish mix and extends into renourishment area. Section 2, is completely within the renourishment area. Section 3, extends from the renourishment area (northward) out of project (2002 Renourishment) boundary (see figure 1).

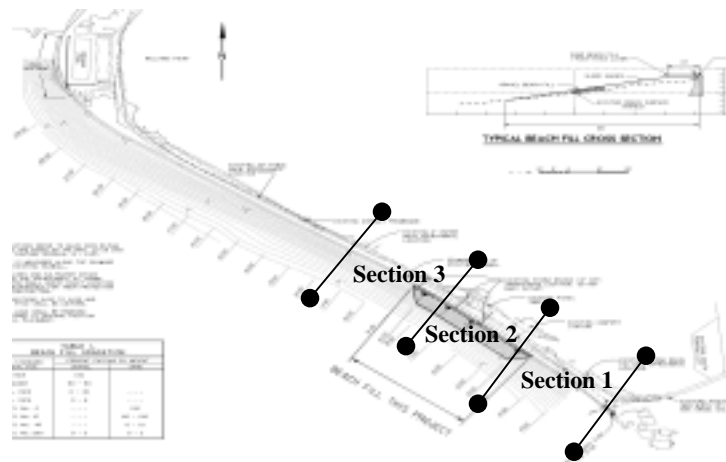


Figure 1

Survey methods were based on the Wolman Pebble Count technique (1954). Transects were diagonal, crossing beach area, working northward. Pebbles were selected randomly at three step intervals by picking the first particle touched by the tip of the index finger at the toe of the wader. The intermediate axis of each particle was measured. A total of 100 measurements per section were taken. Protocol was taken from USDA Forest Service, General Technical Report RM-245, April 1994.

Results

Tables 1 and 2 show the distribution of sediment sizes in Sections 1,2 and 3 for both the November 27th 2002 and May 23, 2003 monitoring events.

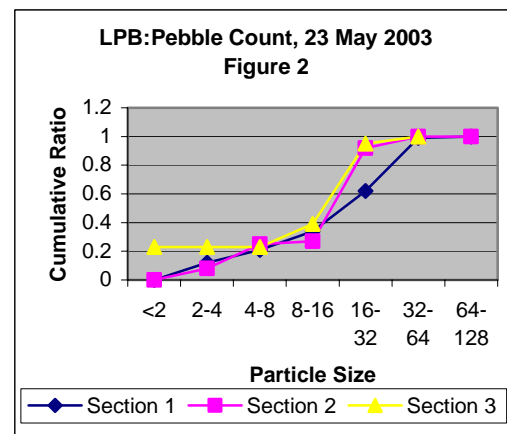
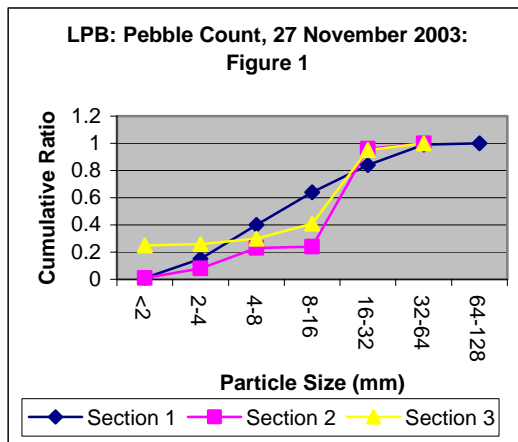
| | Location | | | | | | | | | |
|-----------------|----------|-----------|------|-------|-----------|------|-------|-----------|------|-------|
| | | Section 1 | | | Section 2 | | | Section 3 | | |
| | | | | | | | | | | |
| Size Class (mm) | | | | | | | | | | |
| Sands | | Number | % | Cum % | Number | % | Cum % | Number | % | Cum % |
| | <2 | 1 | 0.01 | 0.01 | 1 | 0.01 | 0.01 | 25 | 0.25 | 0.25 |
| | 2-4 | 14 | 0.14 | 0.15 | 7 | 0.07 | 0.08 | 1 | 0.01 | 0.26 |
| | 4-8 | 25 | 0.25 | 0.4 | 15 | 0.15 | 0.23 | 4 | 0.04 | 0.3 |
| Gravels | 8-16 | 24 | 0.24 | 0.64 | 1 | 0.01 | 0.24 | 11 | 0.11 | 0.41 |
| | 16-32 | 20 | 0.2 | 0.84 | 72 | 0.72 | 0.96 | 54 | 0.54 | 0.95 |
| | 32-64 | 15 | 0.15 | 0.99 | 4 | 0.04 | 1 | 5 | 0.05 | 1 |
| Cobbles | 64-128 | 1 | 0.01 | 1 | | | | | | |

Table 1: Data from November 27, 2002

| | | Location | | | | | | | | |
|-----------------|--------|-----------|----|------|-----------|----|------|-----------|----|------|
| | | Section 1 | | | Section 2 | | | Section 3 | | |
| Size Class (mm) | | Number | % | Cum% | Number | % | Cum% | Number | % | Cum% |
| Sands | <2 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 23 | 23 |
| | 2-4 | 12 | 12 | 12 | 8 | 8 | 8 | 0 | 0 | 23 |
| | 4-8 | 9 | 9 | 21 | 17 | 17 | 25 | 0 | 0 | 23 |
| Gravels | 8-16 | 13 | 13 | 34 | 2 | 2 | 27 | 16 | 16 | 39 |
| | 16-32 | 28 | 28 | 62 | 65 | 65 | 92 | 56 | 56 | 95 |
| | 32-64 | 37 | 37 | 99 | 8 | 8 | 100 | 5 | 5 | 100 |
| Cobbles | 64-128 | 1 | 1 | 100 | 0 | 0 | 100 | 0 | 0 | 100 |

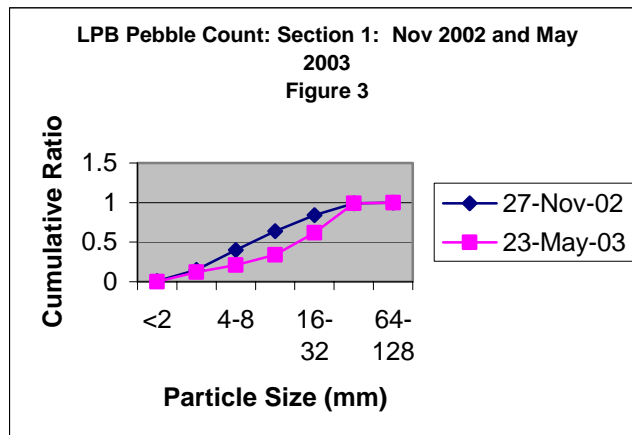
Table 2: Data from May 23, 2003

Figures 1 and 2 show the sediment distribution curves for both dates.



Discussion

The differences noted in Sections 2 and 3 between November 2002 and May 2003 were very minor. The largest differences occurred in Section 1. Figure 3 and Table 3 shows Section 1 for both dates.



| Size (mm) | Percent | |
|-----------|---------|--------|
| | Nov. 02 | May 03 |
| <2 | 1 | 0 |
| 2-4 | 14 | 12 |
| 4-8 | 25 | 9 |
| 8-16 | 24 | 13 |
| 16-32 | 2 | 28 |
| 32-64 | 15 | 37 |
| 64-128 | 1 | 1 |

Table 3. Particle size distribution in Section 1

Conclusion

For Section 1, materials 4-16 mm composed 49% of the sample in November 2002, compared to 22% of the sample in May. However, no notable increases in this size class were noted for Section 2. We can assume that this material migrated away from Section 2 and towards the southeast or higher on the beach (as indicated by piles of fish mix among the drift logs) or was lost in Puget Sound. The increase in materials of size class 16-64mm for Section 1 in May 2003 indicates that when the smaller sized material eroded from the beach, larger materials were exposed underneath. The stability of the 2-4mm size class indicates that this material was embedded within the spaces of the larger material preventing migration. There is no indication that materials migrated from Sections 2 or 3 during this time period, although some localized redistribution probably did occur.

As indicated earlier, Section 1 was nourished with fish mix, a sediment size category approximating the 4-16mm which was lost. This finding is supported by visual estimates of a decrease in the coverage area of the fish mix on the southern Lincoln Park beach. The purpose of this material was to provide spawning habitat for surf smelt and sand lance. Our observations that the fish mix has eroded from the Lincoln Park beach indicate that wave energy in this area is high enough to mobilize sand and pea gravel and that placement of fish mix on this beach will provide very transitory habitat to forage fish species. Monitoring of the substrate will continue to determine if the fish mix continues to migrate from the upper intertidal zone. The next survey will occur in the fall of 2003, approximately 1 year after the 2002 construction event.

References

Stream Channel Reference Sites: An Illustrated guide to Field Technique. (1994). Cherly, C. Harrelson, Rawlins, C.L., and Potyondy, John, P. USDA Forest Service, General Technical Report RM-245